GRANULAR AGGREGATE RESOURCES

CAPE SPENCER (NTS 21 H/4) MAP AREA, NEW BRUNSWICK

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Minerals and Energy Division

Department of Natural Resources and Energy

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ABSTRACT

The Cape Spencer map area (21 H/4) has only one aggregate deposit with significant potential. This deposit, at the mouth of the Mispec River, contains an estimated 250 000 m^3 of workable material, predominantly fine aggregate. Limited volumes of similar material are found at a few other locations in the map area.

RÉSUMÉ

La région couverte par la carte Cape Spencer (21 H/4) ne contient qu'un seul dépôt d'agrégat granulaire d'importance. Ce dépôt, situé à l'embouchure de la rivière Mispec, contient environ 250 000 m^3 de granulat, principalement de taille fine. On trouve en quelques endroits et en quantité limitée d'autres sources de matériaux semblable.

INTRODUCTION

LOCATION AND ACCESS

The Cape Spencer (21 H/4) map area is located along the Bay of Fundy shore, immediately to the east of Saint John Harbour (Figure 1). It comprises a land area of approximately 58.5 km^2, bounded to the north by latitude 45°15' North, to the west by longitude 66°00' West, and to the south and east by the Bay of Fundy (Figure 2). The portion of the area to the west of the Mispec River lies within the City of Saint John.

The only significant road in the area is the Red Head Road, which runs adjacent to the coast in the western half of the area, from Red Head to Cape Spencer. The only significant aggregate deposit lies along this road.

PREVIOUS WORK IN THE AREA

Aspects of the regional surficial geology of southern New Brunswick, including the Cape Spencer area, were described in the early works of Mathew (1879) and Chalmers (1890). The surficial geology of the area has since been mapped in detail by Bélanger (1978), Hunter and Associates (1982; coastal 1 to 2 km only), and Pronk (1985; east half only), and at the regional scale by Rampton and Paradis (1981). The soils of the area, with associated information on surficial geology, were described by Aalund and Wicklund (1950).

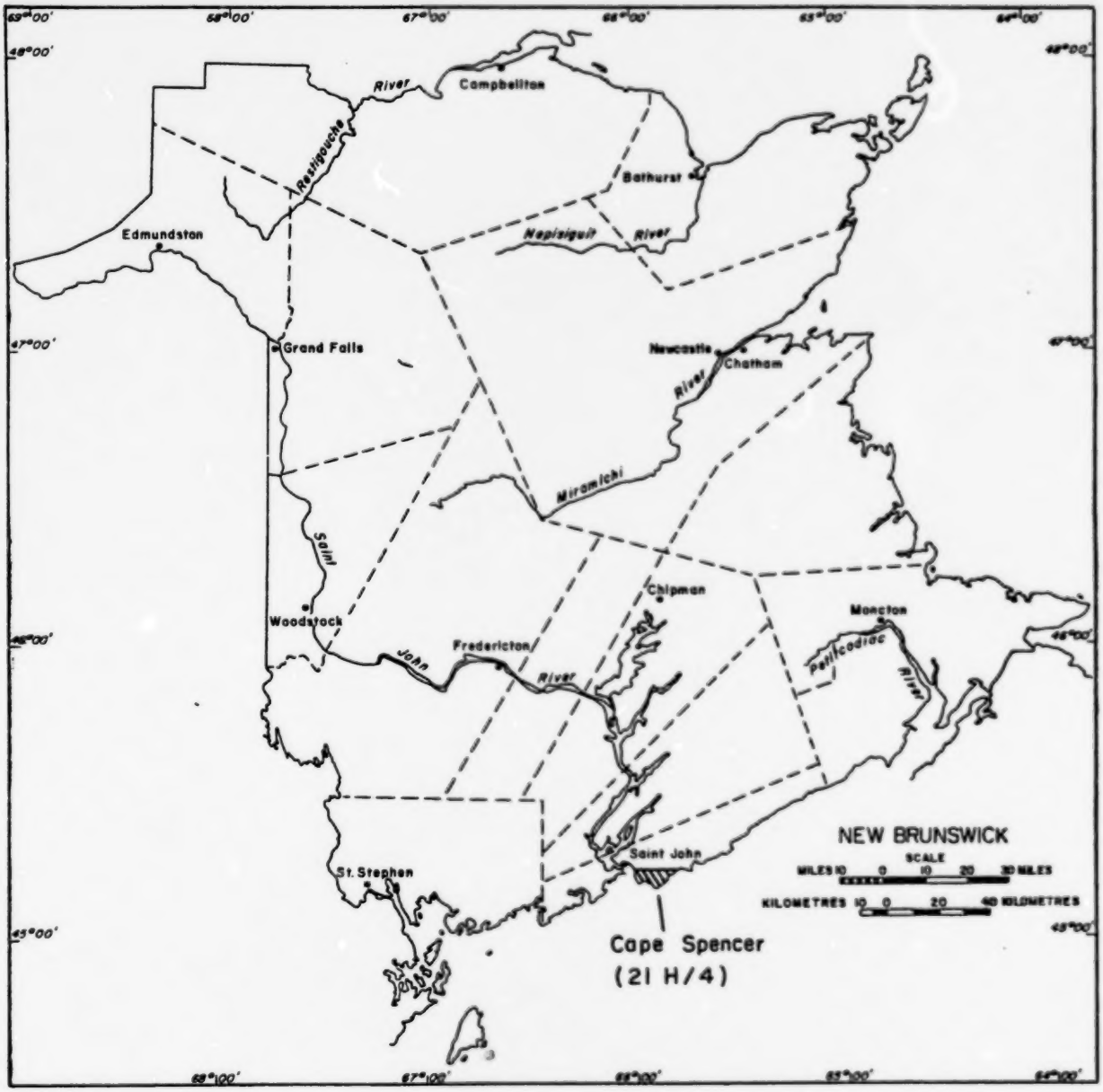


FIGURE 1. Location of the Cape Spencer map area (21 H/4).

THE PRESENT STUDY

The objective of this study is to provide basic information pertaining to the location, extent, thickness, and quality characteristics of the granular aggregate deposits in the Cape Spencer (21 H/4) map area. It is part of a province-wide inventory of granular aggregate resources.

Initial examination of the granular aggregate deposits in the study area was carried out by H. Lohse in the summer of 1975. His field notes were used to supplement the observations of the author, and are credited as such. Field work by the author was conducted for two days in August, 1986, during which all known aggregate excavations were examined and described.

The Appendix contains a detailed description and evaluation of the one site deemed to constitute a significant granular aggregate source. Descriptions of granular aggregate deposits of lesser importance are also included.

ACKNOWLEDGEMENTS

Capable field assistance was provided by Christina L. McLellan. The report was typed by Diane Blair; the figures were drafted by Terry L. Leonard. The map was drafted by Vanderklift Exploration Services, and the sample analysis was performed by ADI Limited. The report and map were edited by Shasta A. Abbott.

PHYSIOGRAPHY AND GEOLOGY

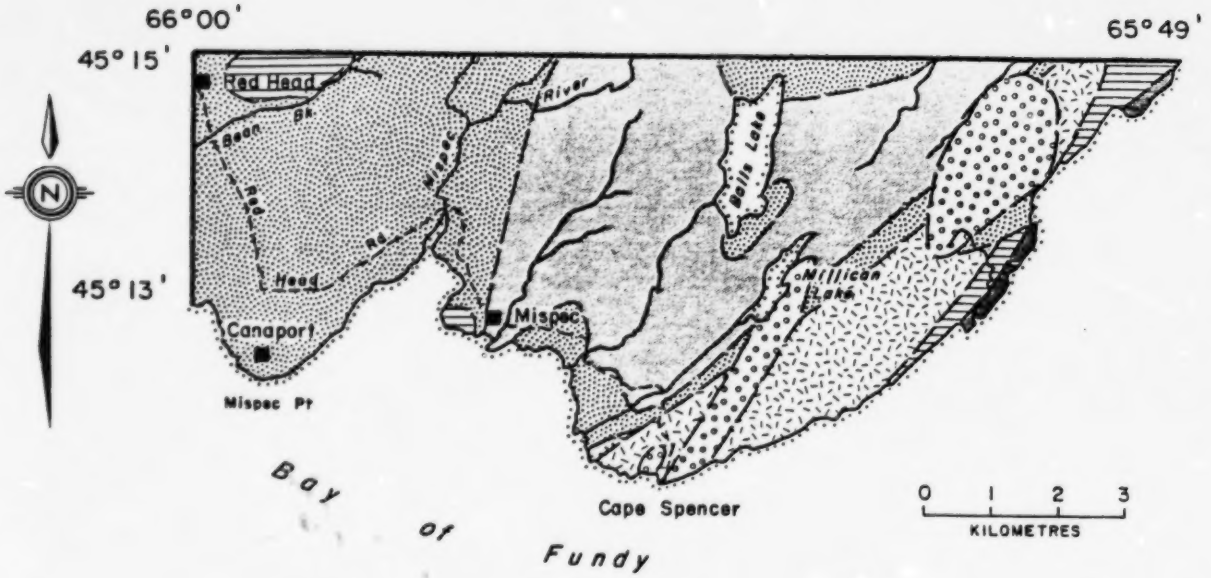
PHYSIOGRAPHY

The Cape Spencer map area lies within Rampton et al.'s (1984) Mispec Plateau subdivision of the Caledonian Highlands physiographic unit. This plateau comprises a highland with an undulating to hilly surface - an expression of deformation patterns in the underlying rocks (Rampton et al. 1984). Relief in the Cape Spencer area is generally in the 15 to 45 m range. Cliffs along the Bay of Fundy coast have heights of similar magnitude. The drainage pattern is parallel, following the structure in the underlying rocks, with local poor drainage in flatter areas (Rampton et al. 1984).

BEDROCK GEOLOGY

The bedrock geology of the Saint John area, including the Cape Spencer map area (Figure 2), has been the subject of considerable investigation. The brief summary that follows is derived from Currie and Nance (1983), to whom the reader is referred for greater detail and further references.

Most of the Cape Spencer map area is underlain by folded sedimentary rocks of Carboniferous age. In the western half of the area, redbed conglomerates, siltstones, and shales are dominant; in the eastern half, grey sandstones dominate. A narrow belt of Precambrian volcanic rocks, containing a few areas of thrust-emplaced Carboniferous granitic rocks, extends



CARBONIFEROUS

shattered to sheared granodiorite, quartz diorite, and granitic schist; minor limestone

clean grey sandstone; minor quartz-pebble conglomerate, red sandstone and shale

red conglomerate, siltstone, and shale; minor sandstone

PRECAMBRIAN

felsic pyroclastic rocks and rhyolite; minor red shale, siltstone, and conglomerate

mafic pyroclastic rocks; minor andesite and basalt

basalt and gabbro

FIGURE 2. Bedrock geology of the Cape Spencer map area (from Currie and Nance 1983).

northeastward along the Bay of Fundy coast from Cape Spencer. A small area of mafic volcanic rocks of Precambrian age is also present at the northwestern edge of the area.

QUATERNARY GEOLOGY

Surficial units: Most of the Cape Spencer map area exhibits a bedrock-dominated surface, ranging from bare bedrock through to a thin veneer of till over rock (Bélanger 1978; Pronk 1985; Rampton and Paradis 1981). However, thicker till blankets (greater than 1 m thick) are present in a few areas (Bélanger 1978; Pronk 1985). Numerous bogs are present in the central part of the map area, between Balls and Millican lakes and the Mispec River (Bélanger 1978).

Glaciofluvial deposits are of minor extent in the area. They occur as terraces at the mouth of the Mispec River and along Bean Brook. These deposits have been mapped as ice-contact stratified drift by Bélanger (1978) and as glaciofluvial outwash by Hunter and Associates (1982). Based on topographic considerations and on the internal structure of the Mispec deposit (gravelly sand, overlying interbedded sand and gravelly sand, overlying interbedded fossiliferous sand and silt and clay) the latter interpretation is preferred; more specifically, these deposits are interpreted here as outwash deltas. Associated with the Bean Brook deposit is a blanket of marine shallow-water sands and gravels at Red Head (Rampton and Paradis 1981).

Quaternary History: The Saint John area was subject to ice flow from a number of directions (Rampton et al. 1984). Three primary ice-flow directions are recorded in the Cape Spencer area; southwesterly (Bélanger 1978; Chalmers 1890; Mathew 1879; this study), southerly (Mathew 1879; Pronk 1985; this study), and southeasterly (Chalmers 1890; Pronk 1985). The chronological relationship between the first two directions is unknown. However, they both appear to predate the latter flow, since till fabric orientations measured by Pronk (1985) trend southeasterly in an area that contains striae related to all three flow directions.

The ice retreated from the Cape Spencer area during the early part of the Bantalor phase, in conjunction with a rising marine limit that ultimately reached an elevation of about 69 m AMSL (Rampton et al. 1984). The deltas in the Cape Spencer map area and a beach deposit to the north-northwest of Cape Spencer lie below 40 m AMSL, and were thus formed subsequent to the period of maximum submergence, since they are not overlain by fine-grained marine sediments. The sediment that formed the deltas was probably derived from meltwater diverted down the Mispec River by an ice margin to the north (Rampton and Paradis 1981). Four dates have been obtained from shells found in the marine sediments at the base of the Mispec delta: 12 800±120 BP (GSC-2640), 12 800±140 BP (GSC-3579), 13 000±200 BP (GSC-3167), and 14 400±530 BP (GSC-2573) (see Rampton et al. 1984, for details). The three younger dates are correlative

with dates from other marine deposits along the Fundy coast to the west. The validity of the older date, on a single shell, has been questioned (Rampton et al. 1984). However, a similar date, within the limits of analytical error, was obtained from shells in a till on the west side of Saint John Harbour (Rampton et al. 1984). It is suggested that the Mispec shell may have been reworked from an older deposit that was formed earlier in the Bantalor phase when the marine level was higher.

Subsequent to formation of the deltas the sea level fell and processes of coastal erosion ensued which continue to this day, resulting in the formation of steep coastal cliffs.

GRANULAR AGGREGATE RESOURCES

Only one significant granular aggregate deposit is present in the Cape Spencer map area. This deposit, the Mispec delta, consists predominantly of sand and gravelly sand. It does not contain a significant amount of crushable material. However, the analysed sample (H4-1; analysed according to A.S.T.M. standards C117-76 and C136-76), after screening out of the gravel component, is still too coarse to satisfy requirements for fine concrete aggregate (A.S.T.M. standard C33-78). Material elsewhere in the deposit, though, could be fine enough to meet these requirements. Detailed testing would be required to ascertain this. Potential workable reserves in this deposit are estimated at 250 000 m^3.

Minimal to limited volumes of aggregate, predominantly fine, are present in a few other granular deposits in the map area. Details concerning these deposits are included in the Appendix.

Rock has been removed from a few quarries in the western part of the area, presumably for use as coarse fill.

CONCLUSIONS

The Cape Spencer map area is deficient in sources of coarse granular aggregate materials, and contains only one significant source of fine aggregate. The latter, the glaciofluvial delta at the mouth of the Mispec River, contains an estimated 250 000 m^3 of workable material.

A limited volume of workable material is present in the small glaciofluvial delta along Bean Brook. Material of local value only may be found in very small or thin deposits of marine origin elsewhere in the map area.

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APPENDIX

SITE DESCRIPTIONS

CAPE SPENCER MAP AREA

21 H/4

LOCATION:	H4-1	**NTS:**	21 H/4
TYPE OF DEPOSIT:	Glaciofluvial outwash (delta)	**COUNTY:**	Saint John
EXPOSURE TYPE:	Pit	**PARISH:**	Simonds
STATUS:	Abandoned	**UTM:**	683 122

SECTION DESCRIPTION & COMMENTS:

Composite Section

0.5 m Soil: Silty soil, developed on the underlying material.

1.6 m Gravelly Sand: Horizontally stratified gravelly medium to very coarse sand, with thin interbeds (2 to 5 cm thick) of openwork pea gravel; the gravel component is predominantly very fine to medium; clasts are subangular to rounded; the sample was obtained from this unit.

7.7 m Slump Covered: Lohse (field notes, 1975) indicates that the material at this level consists of interbedded gravelly sand and fine to medium sand, with a few silty beds.

6.1 m Sand and Silt: Interbedded sand (variable from very fine to fine through to well-sorted medium sand) and reddish brown clay, silt, sandy silt, and silty very fine to fine sand; deformation structures are abundant; many marine shell specimens are present.

The fine material at the base of the section is exposed in an erosional gully in the pit floor. This material makes the base of the pit soft and wet, thus hindering extraction activities. The gravelly sand unit thins toward the west, to approximately 5 m in thickness. Due to the irregular topography of the bedrock in the area (see H4-104), the workable thickness of material is variable in this deposit. Reserves are estimated only for the area to the west of the highway.

This deposit was formed during the period of late-glacial submergence. This is confirmed by radiocarbon dates on shells from the lower unit that range in age from 12 800 to 14 400 yBP (Rampton et al. 1984).

MECHANICAL ANALYSIS:

sieve	50mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600um	300um	150um	75um
% pass.	100.0	98.0	96.8	85.2	62.0	45.1	29.4	12.8	3.7	1.2	0.9

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
17	5	5	250 000

H4-101 **UTM 652 147**

The northern face of this formerly extensive but now overgrown pit exposes approximately 2 m of sandy gravel, with many platy clasts. Lohse (field notes, 1975) indicates that this material is underlain by fine to medium sand with thin silt bands. He also noted the presence of silty clay under sand and gravel in a stream cut to the west of this site. Consequently, the deposit is interpreted to be of marine shallow-water origin in accordance with the interpretation of Rampton and Paradis (1981), rather than the ice-contact origin suggested by Bélanger (1978).

The resources of this deposit were largely confined to the pit area, and are now essentially depleted. The remainder of the area has no significant potential for aggregate production due to the shallow depths to clay, bedrock, or the water table, and to the sterilizing effects of residential development and the oil pipeline from Canaport to the Irving refinery.

H4-102 **UTM 656 141**

This long abandoned, partly overgrown pit is developed in what appears to be, from topographic evidence, a small glaciofluvial delta. The pit is approximately 2 to 5 m deep. A 1.5 m hand-dug section in the upper face exposed well-sorted medium sand. Sand is present throughout most of the pit area, but there are some areas where it is interspersed with sandy, platy gravel.

Reserves in this deposit are probably limited - less than 50 000 m^3.

H4-103 **UTM 678 124**

This small, abandoned pit exposes 1 to 3.5 m of sand, gravelly sand and pea gravel, as at H4-1. The western face exposes a cobbly horizon approximately 0.5 m thick. Workable resources in this deposit are essentially depleted.

H4-104 **UTM 684 119**

Lohse (field notes, 1975) described the southern face of this now abandoned pit as follows:

1.5 to 3.0 m horizontally stratified sandy gravel;
1.8 to 2.1 m rhythmically interbedded sand and red clayey silt;
0.6 m fossiliferous silty clay.

Bedrock is exposed at the surface at the north ends of both this pit and the adjoining one (to the east). Reserves are largely depleted in this portion of the deposit to the east of the highway.

H4-105 UTM 685 115

A slump-covered, 9 m high section at this site appears to consist of sand and gravelly sand as at H4-1. Similar material is presumed to underlie the narrow, flat-bottomed valley extending southward from this point. Bélanger (1978) has mapped a larger area as underlain by granular materials. Test pitting would be required to confirm the actual extent of material in this area. Reserves could potentially be in the order of 10 000 to 50 000 cubic metres.

H4-106 UTM 707 099

This site exposes approximately 1 m of platy beach gravel adjacent to bedrock outcrop. Similar, but thinner, material overlies the striated outcrop to the west. Similar deposits, unidentifiable on the aerial photographs, could be scattered throughout the area, below 70 m AMSL elevation. They have very limited potential as local sources of aggregate.

H4-107 UTM 781 139

Approximately 2 m of sand, becoming pebbly toward the base, overlies bedrock in this area (A.G. Pronk, personal communication, 1986). It is unlikely that there are any significant reserves.

MAPS NOT

FILMED

CARTES

OMISES